

II. CLAIM AMENDMENTS

1. (Currently Amended) A method for reducing visual artefacts due to a block boundary between image blocks in a frame of a digital video signal, which is coded by blocks and then decoded, a block type being defined according to the coding method for a block selected from a predetermined set of coding types, in which comprising performing a filtering operation is performed to reduce visual artefacts due to aon the block boundary, characterized in that the filtering performed on the block boundary is dependesent at least in part on an encoding method used to encode an image block types of the frame in the environmenton a first side of the block boundary (30) and an encoding method used to encode an image block on a second side of the block boundary.

2. (Currently Amended) A method according to Claim 1, ~~characterised in that~~wherein the frame comprises at least one region of image blocks, each block within said region having a region type, and that the filtering operation performed on the block boundary is dependesent at least in part on a region type of thean image blocks in the environmenton a first side of the block boundary (30) and a region type of an image block on a second side of the block boundary.

3. (Cancelled)

4. (Currently Amended) A method according to Claim 1, ~~characterised in that~~wherein at least one parameter of the filtering operation performed to reduce visual artefacts due to a block boundary on at least one side of the block

boundary is modified ~~according to~~ in dependence on the block type encoding method used to encode ~~of at least one image block in the environment of the block boundary~~ ~~(30)~~.

5. (Currently Amended) A method according to Claim 4, ~~characterised in that~~ wherein at least one parameter of the filtering operation performed to reduce visual artefacts due to on the block boundary is modified according to in dependence on the encoding method used to encode block type of a first image block and the encoding method used to encode a second image block, the first and second image blocks being located on opposite sides of the block boundary ~~(30)~~.

6. (Currently Amended) A method according to Claim 4, ~~characterised in that~~ wherein said at least one parameter is selected from a group comprising: a number of pixels to be examined, a number of pixels to be filtered, an activity measure providing an indication of the difference between pixel values on one side of the block boundary, a filtering window.

7. (Currently Amended) A method according to Claim 1, ~~in which~~ comprising selecting a number of pixels (n) ~~is selected for examination from at least one side of the block boundary~~ ~~(30), characterised in that the number of pixels (n) selected for examination in dependence on the image content of the frame in the environment of the block boundary~~ ~~(30), and that the number of pixels (n) selected for examination further depends on the block type of a block in the environment of the block boundary~~ ~~(30)~~.

8. (Currently Amended) A method according to Claim 7, ~~characterized in that~~wherein the number of pixels ~~(n)~~ selected for examination depends on ~~the~~a difference in pixel value ~~(Δ)~~ between pixels across the block boundary.

9. (Currently Amended) A method according to Claim 7, ~~characterized in that~~wherein the number of pixels selected for examination depends on the size of ~~the~~a quantization step ~~(QP)~~ ~~of the~~ used to quantize coefficients used in the encoding of the image blocks.

10. (Currently Amended) A method according to Claim 9, ~~characterized in that~~wherein the number of pixels (n) selected for examination is determined by the formula:

$$n = \begin{cases} 0 & \Delta \geq 2.00\alpha \\ 1 & 1.50\alpha \leq \Delta < 2.00\alpha \\ 2 & 1.00\alpha \leq \Delta < 1.50\alpha \\ 3 & 0.66\alpha \leq \Delta < 1.00\alpha \\ 4 & 0.40\alpha \leq \Delta < 0.66\alpha \\ 5 & 0.25\alpha \leq \Delta < 0.40\alpha \\ 6 & 0 \leq \Delta < 0.25\alpha \end{cases} \quad (2)$$

~~wherein~~ Δ is the difference in value between pixels across the block boundary, $\alpha = QP \cdot \log(QP)$ and QP is the size of the quantization step used to quantize ~~of the said~~ coefficients used in ~~the encoding of the image blocks~~.

11. (Currently Amended) A method according to Claim ~~8~~7, ~~characterized in that~~wherein the number of pixels ~~(n)~~selected for examination is first defined according to the image content of the frame in the environment of the block boundary ~~(30)~~, and then number of pixels (n) is

~~further truncated according to~~ dependence on the block type of encoding method used to encode an image block in the environment of the block boundary (30) to give a truncated number of pixels (n_{tr}) for examination.

12. (Currently Amended) A method according to Claim 11, ~~characterized in that~~ wherein the truncated number of pixels (n_{tr}) is determined by selecting a truncation value (trval) according to the table

Region type of the Block on the Second side								
Region type of the Block on the First side	INTRA		COPY		CODED		NOT_CODED	
INTRA	n	n	2	2	n	4	n	2
COPY	2	2	2	2	2	4	2	2
CODED	4	n	4	2	4	4	4	2
NOT_CODED	2	n	2	2	2	4	2	2

and using said selected truncation value (trval) with the formula

$$n_{tr} = \min(\text{trval}, n), \quad (3).$$

13. (Currently Amended) A method according to Claim 1, ~~characterized in that~~ comprising selecting certain pixels to

be ~~filtered~~ ~~are selected~~, and determining a new value ~~is determined~~ for each pixel to be filtered on the basis of pixels that appear in a filtering window set around the pixel.

14. (Currently Amended) A method according to Claim 17, ~~characterized in that~~ comprising selecting pixels to be filtered ~~are selected~~ from the pixels selected for examination.

15. (Currently Amended) A method according to Claim 13, ~~characterized in that~~ wherein the new value of the pixel to be ~~filtered~~ is the mean value of the pixels that appear in the filtering window.

16. (Currently Amended) A method according to Claim 13, ~~characterized in that~~ wherein ~~for determining a new value for the pixels to be filtered on the first side of the block boundary, said filtering window is used, and the size of the~~ filtering window is determined according to the table

d_r ($d_1 >$	r_1	r_2	r_3
1)			
1	X	X	X
2	1	X	X
3	1	1*	X
4	2	2	X
5	2	2	2**

6	3 or 3	3
	2***	

where

* means that the filtered value of pixel r_1 is used for filtering of pixel r_2

** means that the filtered values of pixels r_1 and r_2 are used for filtering pixel r_3

*** means 3 if $d_1 > 2$, otherwise 2,

and wherein ~~an~~the integer parameter d_r is an activity measure indicating activity on ~~the~~a first side of the block boundary, and ~~an~~the integer parameter d_1 is an activity measure indicating activity on ~~the~~a second side of the block boundary, r_1 , r_2 and r_3 are ~~the~~three pixels on the first side of the block boundary closest to the boundary in this order, X means that the pixel is not filtered, ~~the~~a number means that in addition to the pixel to be filtered, a quantity of pixels shown by the number are taken to the filtering window from both sides of the pixel to be filtered, and "3 or 2" means "3, if $d_1 > 2$, otherwise 2", and for determining the new value of the pixels to be filtered on the other side of the block boundary, a filtering window defined similarly is used, with the exception that all r's are replaced by l's and vice versa.

17. (Currently Amended) A method according to Claim 16, ~~characterized in that~~wherein said activity measure is determined on the basis of changes in pixel values.

18. (Currently Amended) A method according to Claim 16, ~~characterized in that~~wherein

$d_r = 6$, if $|r_1 - r_j| \leq \beta/j$ with all $j \in [1, 6]$,

otherwise: $d_r = i$, where i meets the conditions

$i \in [1, n_{tr}]$,

$|r_1 - r_{i+1}| > \beta/i$, and

$|r_1 - r_j| \leq \beta/j$ with all $j \in [1, i]$,

wherein the auxiliary parameter $\beta = 4 \cdot \log(QP)$ and QP is the size of the quantization step ~~of the~~used to quantize coefficients used in the encoding of the image blocks, and the value of the parameter d_l is determined similarly, with the exception that all r 's are replaced by l 's.

19. (Currently Amended) A ~~device~~filter for reducing visual artefacts due to a block boundary between image blocks in a frame of a digital video signal, which is coded by blocks and then decoded, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, the device comprising a the filter for reducing visual artefacts due to a being arranged to perform a filtering operation on the block boundary, characterized in that the filter is arranged to operate adaptively according to the block types of the frame in the environment of the block boundary (30) in dependence at least in part on an encoding method used to encode an image block on a first side of the block boundary

and an encoding method used to encode an image block on a second side of the block boundary.

20. (Currently Amended) A ~~device~~filter according to Claim 19, ~~characterised in that wherein~~ the filter is arranged ~~such that~~ the frame comprises at least one region of image blocks, ~~each block within said region having a region type,~~ and ~~that~~ the filter is arranged to perform said filtering performed operation on the block boundary in dependence at least in part on a region type of the an image blocks in the environment on a first side of the block boundary (30) and a region type of an image block on a second side of the block boundary.

21. (Cancelled)

22. (Currently Amended) A ~~device~~filter according to Claim 19, ~~characterised in that wherein~~ the filter is arranged to modify such that at least one parameter of the filtering operation performed ~~to reduce visual artefacts due to a block boundary on at least one side of the block boundary is modified according to in dependence on the block type of encoding method used to encode at least one image block in the environment of the block boundary (30).~~

23. (Currently Amended) A ~~device~~filter according to Claim 22, ~~characterised in that wherein~~ the filter is arranged ~~such that~~ to modify at least one parameter of the filtering operation performed ~~to reduce visual artefacts due to a on the block boundary is modified according to in dependence on the block type of encoding method used to encode a first image block and the encoding method used to encode a second~~

image block, the first and second image block being located on opposite sides of the block boundary—(30).

24. (Currently Amended) A devicefilter according to Claim 22, ~~characterised in that~~wherein said at least one parameter is selected from a group comprising: a number of pixels to be examined, a number of pixels to be filtered, an activity measure providing an indication of the difference between pixel values on one side of the block boundary, a filtering window.

25. (Currently Amended) A devicefilter according to Claim 21 19, ~~characterized in that it~~wherein the filter comprises means (42) ~~that operate adaptively according to the image content of the frame, for~~is arranged to selecting a number of pixels (n) ~~for examination from at least one side of the block boundary in dependence on an image content of the frame , and that means (42) for selecting a number of pixels (n) for examination comprises further means (42) for examining the block type of a block in the environment of the block boundary—(30).~~

26. (Currently Amended) A devicefilter according to Claim 25, ~~characterised in that it comprises means (42)~~for~~further arranged to selecting the~~said number of pixels (n) ~~for examination in dependance~~on the difference in pixel value (A) ~~between pixels across the block boundary.~~

27. (Currently Amended) A devicefilter according to Claim 19, ~~characterized in that~~wherein the filter it comprises means (42) ~~for~~is arranged to selecting a number of pixels (n) ~~for examination in dependance~~on the size of ~~thea~~

quantization step ~~(QP)~~ of the used to quantize coefficients
used in the encoding of the image blocks.

28. (Currently Amended) A ~~device~~filter according to Claim 27, ~~characterized in that the means (42) for selecting~~wherein the number of pixels (n) selected for examination comprises means (35) for is determined said number of pixels according to the formula:

$$n = \begin{cases} 0 & \Delta \geq 2.00\alpha \\ 1 & 1.50\alpha \leq \Delta < 2.00\alpha \\ 2 & 1.00\alpha \leq \Delta < 1.50\alpha \\ 3 & 0.66\alpha \leq \Delta < 1.00\alpha \\ 4 & 0.40\alpha \leq \Delta < 0.66\alpha \\ 5 & 0.25\alpha \leq \Delta < 0.40\alpha \\ 6 & 0 \leq \Delta < 0.25\alpha \end{cases}, \quad (2)$$

~~wherein~~ Δ is the difference in value between pixels across the block boundary, $\alpha = QP \cdot \log(QP)$ and QP is the size of the quantization step used to quantize of the said coefficients used in the encoding of the image blocks.

29. (Currently Amended) A ~~device~~filter according to Claim 1925, ~~characterized in that~~wherein the filter it comprises means ~~(42) for is~~ arranged to truncate the number of pixels (n) ~~selected for examination on the basis in~~ dependence on the encoding method used to encode of the block type of an image block in the environment of the block boundary.

30. (Cancelled)

31. (Currently Amended) A ~~device~~filter according to Claim 3029, ~~characterized in that~~wherein the filter means for is

arranged to truncating the number of pixels ~~(n)~~ selected for examination ~~comprises means for~~ selecting a truncation value (trval) according to the table:

Type, of the Block on the Second side								
Type of the Block on the First side	INTRA		COPY		CODED		NOT_CODED	
INTRA	n	n	2	2	n	4	n	2
COPY	2	2	2	2	2	4	2	2
CODED	4	n	4	2	4	4	4	2
NOT_CODED	2	n	2	2	2	4	2	2

and using said selected truncation value (trval) with the formula:

$$n_{tr} = \min(\text{trval}, n), \quad (3).$$

32. (Currently Amended) A ~~device~~filter according to Claim 19, ~~characterized in that~~wherein it ~~comprises means (42)~~for the filter is arranged to selecting certain pixels to be filtered, ~~means (42) for defining a filtering window,~~ and ~~means for~~to determining a new value for each pixel to be filtered on the basis of pixels that appear in a filtering window set around the pixel.

33. (Currently Amended) A ~~device~~filter according to Claim 32, ~~characterized in that~~wherein the ~~means for determining~~

the filter calculates the new value for each pixel to be filtered ~~comprises means for calculating as~~ a mean value of the pixels that appear in the filtering window.

34. (Currently Amended) A device ~~filter~~ according to Claim 2832, ~~characterized in that wherein the filter means for determining a new value for each pixel comprises means for using said filtering window for the pixels to be filtered on the first side of the block boundary, and means for~~ is arranged to determine the size of the filtering window according to the table

d_r ($d_1 >$ 1)	r_1	r_2	r_3
1	X	X	X
2	1	X	X
3	1	1*	X
4	2	2	X
5	2	2	2**
6	3 or 2***	3	3

where

* means that the filtered value of pixel r_1 is used for filtering of pixel r_2

** means that the filtered values of pixels r_1 and r_2 are used for filtering pixel r_3

*** means 3 if $d_1 > 2$, otherwise 2,

and wherein ~~an~~the integer parameter d_r is an activity measure indicating activity on the first side of the block boundary, and ~~an~~the integer parameter d_l is an activity measure indicating activity on the second side of the block boundary, r_1 , r_2 and r_3 are ~~the~~ three pixels on the first side of the block boundary closest to the boundary in this order, X means that the pixel is not filtered, ~~the~~a number means that in addition to the pixel to be filtered, a quantity of pixels shown by the number are taken to the filtering window from both sides of the pixel to be filtered, and "3 or 2" means "3, if $d_1 > 2$, otherwise 2", and means for using a filtering window defined similarly for determining the new value of the pixels to be filtered on the other side of the block boundary, with the exception that all r's are replaced by l's and vice versa.

35. (Currently Amended) A ~~device~~filter according to Claim 34, ~~characterized in that~~wherein

$d_r = 6$, if $|r_1 - r_j| \leq \beta/j$ with all $j \in [1, 6]$,

otherwise: $d_r = i$, where i meets the conditions

$i \in [1, n_{tr}]$,

$|r_1 - r_{i+1}| > \beta/i$, and

$|r_1 - r_j| \leq \beta/j$ with all $j \in [1, i]$,

wherein the auxiliary parameter $\beta = 4 \cdot \log(QP)$ and QP is the size of the quantization step ~~of the~~used to quantize

transformation coefficients used in transformation coding of the image blocks, and the value of the parameter d_1 ~~being~~is determined similarly, with the exception that all r 's are replaced by 1's.

36. (Cancelled)

37. (Currently Amended) A video encoder ~~(10)~~ comprising means ~~(35-44)~~ for coding and means for decoding a digital video signal by blocks, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, which encoder comprises a filter for reducing visual artefacts due to a block boundary, ~~characterized in that~~wherein the filter is arranged to operate adaptively according to the block types of the frame in the environment of the block boundary ~~(30)~~.

38. (Currently Amended) A video decoder ~~(20)~~ comprising means ~~(35-44)~~ for reducing visual artefacts in a frame of a digital video signal, which is coded by blocks and then decoded, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, which video decoder comprises a filter for reducing visual artefacts due to a block boundary, ~~characterized in that~~wherein the filter is arranged to operate adaptively according to the block types of the frame in the environment of the block boundary ~~(30)~~.

39. (Currently Amended) A video codec ~~(10, 20)~~ comprising means ~~(35-44)~~ for coding and decoding a digital video signal by blocks, a block type being defined according to the coding method for a block selected according to a

predetermined set of coding types, which video codec comprises a filter for reducing visual artefacts due to a block boundary, ~~characterized in that~~wherein the filter is arranged to operate adaptively according to the ~~the~~ block types of the frame in the environment of the block boundary ~~(30)~~.

40. (Currently Amended) A mobile terminal ~~(46)~~ comprising a video codec ~~(10, 20)~~, which comprises means ~~(35-44)~~ for coding and decoding a digital video signal by blocks, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, which video codec comprises a filter for reducing visual artefacts due to a block boundary, ~~characterized in that~~wherein the filter is arranged to operate adaptively according to the ~~the~~ block types of the frame in the environment of the block boundary ~~(30)~~.

41. (Currently Amended) A storage medium for storing a software program comprising machine executable steps ~~code~~ for ~~coding and decoding a digital video signal by blocks, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, for reducing visual artefacts due to a block boundary by filtering, characterized in that the software program further comprises machine executable steps for filtering adaptively according to the the block types of the frame in the environment of the block boundary (30)~~ performing a method according to Claim 1.

42. (New) A method of video encoding including a method for reducing visual artefacts according to Claim 1.

43. (New) A method of video decoding including a method for reducing visual artefacts according to Claim 1.

44. (New) A method for reducing visual artefacts in a frame of a digital video signal, which is coded by blocks and then decoded, a block type being defined according to the coding method for a block selected from a predetermined set of coding types, in which filtering is performed to reduce visual artefacts due to a block boundary, wherein the filtering performed on the block boundary depends on block types of the frame in the environment of the block boundary and at least one parameter of the filtering performed to reduce visual artefacts due to a block boundary on at least one side of the block boundary is modified according to the block type of at least one block in the environment of the block boundary, said at least one parameter is being selected from a group comprising: a number of pixels to be examined, a number of pixels to be filtered, an activity measure providing an indication of the difference between pixel values on one side of the block boundary, a filtering window.

45. (New) A device for reducing visual artefacts in a frame of a digital video signal, which is coded by blocks and then decoded, a block type being defined according to the coding method for a block selected according to a predetermined set of coding types, the device comprising a filter for reducing visual artefacts due to a block boundary, wherein the filter is arranged to operate adaptively according to the block types of the frame in the environment of the block boundary and is arranged such that at least one parameter of the filtering performed to reduce

visual artefacts due to a block boundary on at least one side of the block boundary is modified according to the block type of at least one block in the environment of the block boundary, said at least one parameter being selected from a group comprising: a number of pixels to be examined, a number of pixels to be filtered, an activity measure providing an indication of the difference between pixel values on one side of the block boundary, a filtering window.

46. (New) A method for reducing visual artefacts due to a block boundary between image blocks in a frame of a digital video signal, comprising performing a filtering operation on the block boundary that is dependent at least in part on an encoding method used to encode an image block on a first side of the block boundary.

47. (New) A filter for reducing visual artefacts due to a block boundary between image blocks in a frame of a digital video signal, the filter being arranged to perform a filtering operation on the block boundary in dependence at least in part on an encoding method used to encode an image block on a first side of the block boundary.

48. (New) A video encoder comprising a filter according to Claim 47.

49. (New) A video decoder comprising a filter according to Claim 47.

50. (New) A mobile terminal comprising a filter according to Claim 47.

51. (New) A storage medium for storing a software program comprising machine executable code for performing a method according to Claim 46.

52. (New) A method of video encoding including a method for reducing visual artefacts according to Claim 46.

53. (New) A method of video decoding including a method for reducing visual artefacts according to Claim 46.

54. (New) A video encoder comprising a filter according to claim 19.

55. (New) A video decoder comprising a filter according to claim 19.

56. (New) A video codec comprising a filter according to claim 19.

57. (New) A mobile terminal comprising a filter according to claim 19.